preceded by sudden facial blanching. Such a reaction is rare in paroxysmal supraventricular tachycardia, but may occur and one is always prepared if the technique includes standing in front of the patient. In case of a syncopal reaction, the hands are in ready position to hold the patient and to lower him into a recumbent position.

CONCLUSION

Carotid sinus stimulation also has a place in the differentiation of arrhythmias.[1] It has been used to identify the hypersensitive carotid sinus syndrome, and as a routine in complete neurological examinations. Its employment for the latter purpose in the middle aged or elderly individual with arteriosclerosis should be cautiously weighed. Untoward cerebral accidents have occurred[2] and although these are forunately very rare, the possibility should be recognized and should enter into the consideration of the indications and contraindications for the use of the maneuver.

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VARIATIONS IN SIZE OF THE HUMAN STOMACH*

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TEXT books provide few and sometimes conflicting data regarding the size of the human stomach. Cunningham's Textbook of Anatomy contains the statement, "probably no organ in the body varies more in size within the limits of health than the stomach"; however, it is not clear whether "size" refers to weight or capacity, post mortem measurements of which are recognized to be misleading. Specific records of stomach size are not common, but several have been reported. All deal either with weight of the organ or with its capacity. Ross[1] reports the normal stomach capacity as 1-2 liters and the normal weight as 125 to 175 grams. Reed[2] notes the "average capacity" as 1600 to 1700 cc. and the normal weight range as 113.4 to 141.75 grams.

POST MORTEM MEASUREMENTS

Measurements of the capacity of the stomach post mortem are not reliable because of the impossibility of standardizing the degree of distension of the organ. Differences in the amount of muscle, rigor mortis, and other post mortem changes may influence the distensibility. A more reliable index of stomach size is the total area of the mucosa after it is spread so that all folds are removed. In stomachs which are not distended, the mucosa, because of its folds, has an area greater than that of the muscular wall. When the latter is stretched the mucosal folds are progressively flattened until they disappear and the mucosal surface is uniformly parallel to that of the muscle. This disappearance of the mucosal folds on stretching of the stomach is an end point which can be recognized readily. Although most methods of stretching cause some further tension to be applied to those portions of the mucosa, where folds are absent or disappear early, this does not lead to much increase in area because gastric mucosa can be stretched only slightly after the folds are flat, and will tear before there is much increase in area. This standardized stretching procedure is easily accomplished with the excised opened stomach and such a method has been used in this study.

One hundred and twenty-six human stomachs obtained at autopsy have been measured. Most of the specimens were obtanied within six hours of the time of death, and none has been included in which post mortem digestion of the mucosa has been been more than superficial. The stomachs have been opened along the greater curvature and have been pinned to a board in the stretched position before fixation in 4 per cent aqueous formaldehyde. After fixation, maps have been prepared by tracing the outline of each specimen on paper, and the areas of gastric mucosa have been measured from the maps by means of a planimeter. Average values for stomach mucosal area obtained in this way are 843 sq. cm. for males and 763 sq. cm. for females.

All of the stomachs were weighed after formalin fixation and removal of the attached ligaments and masses of fatty tissue, and the value was corrected later by subtracting the weights of the attached portions of esophagus and duodenum, which were removed after histological sections had been prepared. The average stomach weight was 165 grams in males and 150 grams in females. Fig. 1 shows the relation between the mucosal area and the stomach weight in the individual cases. The greater weight of those stomachs having large mucosal areas indicates that differences in the latter are not due merely to variation in degree of stretching. Preliminary observations show the greatest thickness of mucosa in the stomachs with large areas, so it is apparent that the mucosal area provides a rough index of the quantity of mucosal tissue present.

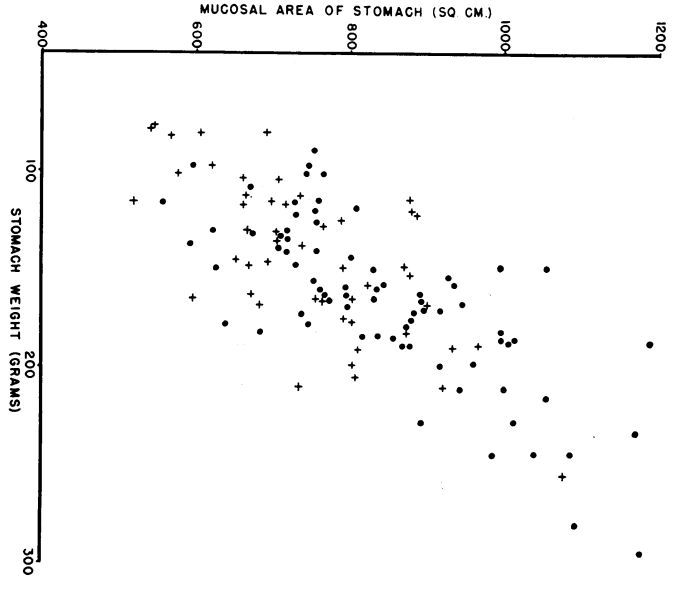

Chart 1.—Differences in Size of the Human Stomach (based on measurements of 126 stomachs).
Solid circles represent males; crosses represent females. One additional stomach from the series (area 1536 sq. cm. and weight 453 gms.) was so much larger than the others that it was not included in this chart.

The extreme values for mucosal area in this series are 520 and 1536 sq. cm., and the range of stomach weight is from 77 to 453 grams. These represent variations of three and six fold respectively. The differences are not related to age of the patients, which ranged from 19 to 83 years.

* Read before the Section on Pathology and Bacteriology at the Seventy-fourth Annual Session of the California Medical Association, Los Angeles, May 6-7, 1945.

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Similarly, body height and body weight have shown no close correlation with stomach size. The sex difference recorded above is no greater than sex differences in weights of other organs, and is considerably smaller than differences within each sex group. Therefore, it has been concluded that some other influence is largely responsible for determination of stomach size.

COMMENT

It is possible that functional factors may contribute to stomach size. This may bear a relationship to work performed similar to that suggested by Addis and co-workers[3,4] for the heart, kidney, liver, and gastrointestinal tract of experimental animals, but it has been impossible to demonstrate such an influence since no reliable information is available concerning the eating habits of the patients in this series. The stomach size bore no apparent relation to the nutritional state of the individuals.

Many diseases are represented in this series of cases, but most do not occur with sufficient frequency to permit valid conclusions regarding their relation to stomach size. No constant relationship to specific disease has been observed. Cases of carcinoma of the stomach, which greatly modifies the stomach size, have not been included in this series. Other gastric lesions were not obviously related to the size of the organ. Several stomachs exhibiting gastric ulcer showed little deviation from the average. As a group, the cases showing the changes of so-called chronic atrophic gastritis had normal sized stomachs, although two of four cases of pernicious anemia with severe mucosal changes had areas of 542 and 546 sq. cm. respectively. These were two of the three smallest stomachs in the series.

Two other groups of cases showed variations from the average stomach size which can only be mentioned because, due to the small number of cases, the significance of the differences is questionable. Stomachs from eight patients with diabetes mellitus had an average mucosal area which was 23 per cent greater than that of non-diabetic patients. In 17 stomachs from cases of chronic or healed duodenal ulcer, the average area was 9 per cent greater than that of cases without duodenal ulcer. There was no anatomical obstruction of the pylorus in any case. Clarification of the reasons for these apparent differences will require further observation.

SUMMARY

Measurements of mucosal area and total weight have been made in 126 human stomachs obtained at autopsy. Variations in stomach size are significant but cannot yet be explained. Differences in sex, age of patients, or body size do not account for the differences in the stomachs. Possible relationships to other conditions have been discussed.

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This government, with its institutions, belongs to the people who inhabit it. Whenever they shall grow weary of the existing government, they can exercise their constitutional right of amending it, or their revolutionary right to dismember or overthrow it.

—Abraham Lincoln, *Speech*, at first Republican State Convention in Illinois, 1856. Quoted by Theodore Roosevelt in address before Ohio Constitutional Convention, Columbus, February, 1912.

ANATOMICAL DEMONSTRATION OF THE ANOVULATORY MENSTRUAL CYCLE*

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IN 1923, George W. Corner,[1] and in 1927, Corner,[2] Carl G. Hartman,[3] and Edgar Allen[4] reported that recurrent hemorrhage from the healthy uterus occurred in the macacus rhesus without ovulation and in the absence of premenstrual changes in the endometrium. Corner[2] suggested the possibility that a similar type of menstruation might be found in women. Since these original publications, a large body of information on the anovulatory cycle of the monkey has been carefully accumulated.[5,6] Using the castrated monkey as experimental animal, Edgar Allen[4] demonstrated that discontinuation of estrogen treatment would result in menstruation and his observations became the basis for the estrin deprivation theory of menstruation. The similarity of the bleeding phenomena between the anovulatory and ovulatory menstruation was further emphasized and rather convincingly demonstrated in the experiments of Markee[7] who studied the bleeding mechanism in intraocular endometrial implants in both conditions.

In women, a small number of cases have been reported in which the examination of the pelvic organs free of pathology offered sufficient proof to make the diagnosis of an anovulatory cycle.[8,9,10] On the other hand, most of the textbooks on this and related subjects state that anovulatory cycles probably occur much more frequently and the condition has become a rather well recognized endocrine entity.[11,12] Statements as to the frequency of this type of menstrual cycle are of necessity vague, although clinicians usually point out that the incidence is probably higher during the first years following the menarche as well as during the period preceding the menopause. However, anovulatory cycles may be found at any time during the reproductive period of life. (Example. Case 8 of Bartelmez.)

REPORT OF CASE

The present report is of a 12 year old girl who came to autopsy 26 hours after a spontaneous intracerebral hemorrhage with no history of trauma. The girl had been well except for whooping cough at 5 and chicken pox and mumps between the ages of 6 and 8. Her menarche was 4 months prior to death, and four menstrual periods had been regular and without pain. Her last menstrual period was one week before death.

At autopsy, the girl was well developed including the secondary sex characteristics. She weighed 105 pounds and was 5 feet 2 inches tall. The brain showed a large defect in the frontal and parietal lobes filled with blood. The hemorrhage had occurred from one of multiple malformations in the wall of the cortical branches of the left middle cerebral artery. There was no evidence of trauma or previous hemorrhage. The remaining tissues and organs were normal although several sections taken from the aorta showed multiple microscopic areas of medial degeneration. Examination of the genital organs revealed the following: The uterus was normal, the length of the uterine body approximately equalled that of the cervical canal and cervix. The endometrium was regular, thin, and firm, measuring 1 mm. in thickness. The tubes were normal. The surfaces of the ovaries were smooth except for a small dimpled area in the left ovary. On sectioning, both ovaries contained numerous small cysts measuring up to 0.7 cm. in diameter. The left ovary contained a small yellowish structure which proved to be an old corpus luteum on histologic examination. The cysts were lined partly by healthy appearing granulosa cells, partly by granulosa cells showing karyorrhexis, and partly by theca interna cells. The cortical zone contained numer-

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* Read before the Section on Pathology and Bacteriology, at the Seventy-fourth Annual Session of the California Medical Association, Los Angeles, May 6-7, 1945.

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